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Presentations

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Constitution of Forest Ecosystem Services Regulatory Authority for developing Effective Market Mechanism for the Ecosystem Services provided by Forests

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- Prof N.H. Ravinderanath

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- Shri B.M.S. Rathore

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- Prof. Anatoly Shvidenko

Understanding present and future carbon cycling of forests: Some methodological problems

- Dr. Promode Kant

The Possible Contours of Mitigation and Adaptation in Forestry Sector in India in the Coming Decade

- Dr. S. Balaji

Eco systems resilience and forest biodiversity enhancement through joint forest management – Tamil Nadu experience

- Dr. Renu Singh

India and REDD+: Opportunities and Challenges of Implementation

- Dr. M.S.R. Murthy

Indian Forest Carbon Cycle Assessment

- MK Gupta and SD Sharma

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• Sparsh Kala Carbon stock of trees outside forests (2005-2009)
• SL Swamy Tree growth, c sequestration and n allocation in Gmelina arborea roxb. Stands grown in monocultures and agrisilviculture
• Atanu Kumar Raha Sundarban and Global Warming – where lies the threat
• Dr Shamilla Climate change and its impact on the forest insect pests
• Dharmendra Verma Challenges of Joint Forest Management and Green India Mission
• Dinesh Kumar Silvicultural Challenges and Opportunities for Green India Mission
• R Vivekanandan Going Green Computing – An ecological perspective to reduce carbon footprint in forestry organizations
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THEME 1

Forests in Society

1.1 – Forests and Land Use Policy
1.2 – Forests in Urban Landscape
1.3 – Forest Governance and Institutional Reforms
1.4 – Forests and Community: Forging Partnerships
1.5 – Forests and Traditional Knowledge
Introduction of TBS

Tarun Bharat Sangh (TBS) is an NGO working in the state of Rajasthan, since 1985.

TBS seeks to bring dignity and prosperity to the life of destitute section of rural India through sustainable development measures.

As TBS situated in semi arid region of Rajasthan, the water and forest conservation becomes the first step of development. From this activity all other progressive activities flow.
Forests in Society

**Revival of systems using indigenous knowledge**

- Interventions understanding traditional systems and use of indigenous knowledge
- Mobilization of community around land, water and forest
- Participation in rejuvenating old systems and evolving of new systems.
- Creation of new village level and forest area institutions.

**RE-AWAKING THE INDIGENOUS KNOWLEDGE**

*Traditional Forest Management system in India*

There are various types of methods of Forest Management in India. The main common features of all systems are:
- Use of local resources and technology
- Community based operation
- Community driven de-centralized forest management
- Sustainable conservation and use of natural resources

**Neglect of traditional systems**
- Due to implementation or expectation of modern facilities, the traditional systems have been neglected.
- Disintegration of community institutions
- The modern education and hollow dreams of modernity have disintegrated the community Institutions.

**Paradigm change**
- Exploitation and disintegration has taken the place of ‘feeling together’ and integration.

**State takeover community functions**
- The State has dispossessed the Communities of their traditional rights and responsibilities.

**Syndrome of dependence**
- Wherever the State succeeded (even partially or for a short period) in implementing modern amenities like water supply, sewage or power, the communities have lost their initiative.

*Panoramic view of the topography of the area*

*1985*

Degraded and barren land in the catchment areas of Arvari river & extended drought had forced people to migrate out of their villages.

*Degraded and barren land in the catchment areas of Arvari river & extended drought had forced people to migrate out of their villages.*

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River Goes Dry:

Excess withdrawal of Groundwater

River is flowing:

- Increased Groundwater Recharge
- Less Groundwater Extraction
Forests and Land use Policy

...A perspective

A.K.Jha

Land Use: determinants

Land use is determined by the soil and topography, water table in general and availability of water in particular, production and productivity of land, and the parameters of socio-economic development.

Determinants: statutory/ Mgmt

- National Forest Policy 1988
- Indian Forest Act 1927
- Wildlife Protection Act 1972
- Forest Conservation Act 1980
- Biodiversity Act
- State-specific Grazing policy and Grazing Rules
- Working Plan prescriptions
- Microplans under JFM/VEDs
- ....But Regional Planning Acts ..donot include ..
The Statistics

- India has a geographical area of 3.07 lakh Sq.Km : world’s 2.4%.
- The recorded forest is 7.65 lakh Sq.Km and the forest cover 6.33 lakh Sq.Km : world’s 1.8%.
- India’s livestock population is 47 crores which is world’s 18% while the grazing land is 0.5% of the world’s grazing land.
- Approximately 27 crore livestock graze in the forests.
- Human population in India is 121 crores.

The gradual transition

The previous two decades of National initiatives in forestry and nature conservation have been accompanied simultaneously with the increase in understanding and empowerment of the institutions of democracy, governance and decentralization of functional authority to local self-governing institutions.

Transition

LAND IS LIMITED…..whether under forest category or not.. A resource that cannot be created…………it can of course be diverted……..

Mindsets:
Resource management
- By whom
- For whom

Institutional issues:
- Who controls what
- Who controls whom

Forest land use change due to (indirect) causes - social and institutional processes

- Market dynamics and perverse incentives
- Corruption
- Inappropriate state policies and institutional failure
- Population pressure
- Poverty
- complex mix of socio-economic, cultural, and political factors

An approach to land use policy development and implementation: The Strategy

- Adopt a holistic point of view
- Challenge the poverty paradox of rural and tribal populations.
- Introduce statutory interventions
- Put in place institutional structures of multi-disciplinary character
- Strong co-ordination amongst various related departments, NGOs and various stakeholders.
- Adopt inclusive and informed Landscape approach.
Components:

1. Conceptual Aspects
- Long term Sustainability of resources as well as livelihoods
- Address equity issues
- Benefit the land-less also
- The policy must be operational irrespective of ownership of land
- Sustain and improve productivity and prevent the degradation of stressed lands

2. Institutional level interventions
- ‘Forest Land-use Authority’ be set up.
- Put in place a programme for ‘Non-Forest Wastelands Development through involvement of Private Sector’ (NWDIPS).
- FDAs be designated as the nodal and co-ordinating agency.
- The working plan wing should be strengthened to ensure compliance of forest land use policy with special reference to the exercise of forest rights.

3. Statutory interventions
- Empower Gram Sabhas
- The National Bank for Agriculture and Rural Development Act, 1981 be amended to become National Bank for Agriculture, Forestry and Rural Development Act for facilitating management of the mosaic of land use.
- Rationalize rules regarding planting, felling, and transit

4. Market related interventions
- Incentivize private growers
- Forest based industries’ capital be attracted for investing on public as well as private Wastelands.
- Industries showing interest in energy sector: provide opportunity to invest on forest lands on “Public Private Partnership” basis.
- Minimum support prices be introduced for the site-appropriate crops.
- 5. Subsidize the tackling of problematic lands.

5. Plan and Technology related interventions
- Appropriate R&D facilities be set up/ integrated through networking: develop technological options to match the appropriate land use.
- Operational research related to forward linkages, market dynamics, community mobilization, and institution building aspects.
- Plantations and SMC works under MNREGA be redesigned for catering to Landscape approaches on project basis.
Land use categories

- Forest
- Non-agricultural use
- Barren and unculturable land
- Permanent pasture and other grazing land
- Land under miscellaneous Tree crops
- Culturable wasteland
- Fallow lands other than current fallows
- Current fallow
- Net area sown
- Gross cropped area

Plan and Technology based interventions

- Suitable schemes be devised and incentivized for sustainable use of steep slopes.
- Traditional and indigenous techniques of treatment be documented and used as required.
- Area specific models for agri-silvicultural, silvi-pastoral, agri-silvi-pastoral, agri-silvi-horticultural, agri-silvi-horti-pastoral etc. interventions be developed.
- Use of latest technologies.
- Interface between Silvicultural and Watershed approaches

6. Implementation level interventions

- Identification of viable units of treatable lands within the framework of landscape management.
- Utilize the strengths and capacities developed under programmes like IWDP, JFM etc. as a part of convergence strategy.
- Capacity building at all levels and for all stakeholders should precede field level implementation.

FRA and other Acts induced land use change

- More than 11 lakh Individual Right Holders finalized today out of 33 lakh applicants (Area involved approx. 99 lakh acres.) mostly pock marked….
- Very few Community Rights are being claimed-but the process of making them prefer their claims is on. (2/3rd forest area will be under community claims)
- There is a spate of new encroachments
- FRA and PESA at loggerhead on MFP ?

Summing up..

Its high time..
..that Nature be helped by us to help sustain mankind !

Land use – remedies?

- Do we really want a land use or policy?
- Can we have a land use map that could be relevant on a long time frame ?
- Shall technological innovations necessarily have positive effects on maintaining and sustaining forest land use?
- Do we adopt Reducing emissions from the tropical deforestation and forest degradation (REDD+) for firming up land use?
- Do existing legal instrument sufficiently back land use choices?
Ineligible case: Claimant ID-0301kha00bpp4
Jalgaon: Massive change in land use after Nov. 2005

Gadchiroli Distt.-Village “Bamni”- forested areas were claimed on large scale on the fringes!!
Taking Forestry in India to a new level

Dr. Bransdon Corrie, IFS
Addl Principal Chief Conservator of Forests, Kerala.

The time for action is now.

- We are at a defining moment in the history of humanity and forests occupy centre stage
- Changes in global climate are already stressing forests
- In this climate of change focus is increasingly shifting to forests

Current status of forestry in India

- Forestry in India is more about the science of forestry and less about the science of management
- The National Forest Commission has opined that the forest personnel on their part need to radically change their mind set, vision and professionalism.
- The forest service must become more specialized and professional and receive political, infrastructural and financial support
The challenge

- With 1.8% of the world’s forest area, the country is to meet the needs of 16% of the world’s population and 18% of its domestic cattle.
- Livelihood issues of 7 crore tribals and 20 crore non-tribal rural population is linked to forests.
- 4 crore people live in 1.73 lakh villages in and around forests.

The way ahead

- With a rapidly rising population, a steadily diminishing resource base, and increasing levels of consumption, foresters face the greatest of challenges.
- To meet these challenges successfully, forest management practices in India must be taken to a new level.

Materials and Methods

- The 7S Framework is used as a tool to present the Strategic model for Forest Management.
- Initiatives in Kerala Forest Department.
- Survey of State Forest Departments.
- Experiential Learning of Forest Management practices of the various agencies in US.

Taking forestry to a new level

- HRD Plan with a Placement Policy.
- Motivational Programmes ignite the fire of enthusiasm.
- Personal Action Journal.
- Technical Audit of sanctuaries.
- Protocols for monitoring habitat and species.

KFD Initiatives

- Questionnaire and telephone interviews.
- Vision, Mission, goals, values.
- Organizational environment.
- Systems and protocols, and Technology use.

Survey of SFD’s
Experiential learning

- Ecosystem approach - US Forest Service
- Adaptive management - USF&WL S
- Visitor experience - NPS
- Managerial principles - USFS
- Enabling environment - USFS
- Technology - USFS
- Systems and protocols - USFS
- Certification - DNR - Minnesota

The 7S Framework

- Super ordinate Goals: Vision, Mission, Goals, values, culture
- Strategy: The plan for marshalling resources
- Structure: Hierarchy, reporting system, duties and responsibilities
- Systems: The protocols, its codification and institutionalization
- Style: approach, attitude of leadership
- Staff: capabilities, capacity building, performance enhancement
- Skills: the ability to deliver to a reasonable standard on the assigned task

1. Super ordinate goals

- Vision: Luxuriant forests professionally managed to provide ecosystem goods and services to society on sustainable and equitable principles
- Mission: To serve society through responsible stewardship of forests
- Goals: To manage forests on sustainable and equitable principles so that the ecosystem goods and services flow to all sections of society in perpetuity
- Core values: Fairness, camaraderie, loyalty, discipline.
- Organization culture: values, beliefs, underlying assumptions, attitudes, and behaviors

2. Strategy

- Develop and share a Vision
- Focus on personnel, leadership development
- Provide an enabling environment
- Develop the route map - Plans, procedures, processes, practices, policies
- Codify and institutionalize systems and protocols
- Ecosystem approach, adaptive management
- Technology use
- Annual audit and certification of institutions and individuals

3. Structure

- Flatten
- Line hierarchy
- Line reporting
- Duties and responsibilities
- Review and revamping existing structure

4. Systems

- Protocols – procedures and processes
- Planning
- Management
- Documenting
- Reporting
- Monitoring
- Evaluating
- Certification

<< Back to contents
5. Style

- Leadership approach
- Organizational approach
- The fundamental task of a leader is to prime a good feeling in those they lead
- The absence of this singular element is responsible for the failure of the India Forest Service to leverage the great talent and experience that is resident dormant in the service

<table>
<thead>
<tr>
<th>Leadership Style</th>
<th>Visionary</th>
<th>Affiliative</th>
<th>Democratic</th>
<th>Coaching</th>
<th>Pacesetting</th>
<th>Commanding</th>
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<tbody>
<tr>
<td>Mobilizes people toward a vision</td>
<td>Creates harmony and builds emotional bonds</td>
<td>Forges consensus through participation</td>
<td>Develops people for the future</td>
<td>Sets high standards for performance</td>
<td>Demands immediate compliance</td>
<td></td>
</tr>
<tr>
<td>For new direction/ change management</td>
<td>To motivate</td>
<td>Consensus to get inputs</td>
<td>To improve performance</td>
<td>To get quick results</td>
<td>In crisis, with problem employees</td>
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<tr>
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<td>Positive</td>
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<td>Positive</td>
<td>Negative</td>
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</table>

6. Staff

- Capability
- Ability
- Capacity building- skills upgradation
- Focus- on outcomes

7. Skills

- Technical
- Human
- Conceptual
- Design
NEED FOR A SEPARATE POLICY AND INSTITUTIONAL FRAMEWORK FOR PRODUCTION FORESTRY ON NON-FOREST AREAS

R. C. DHIMAN

TRASFORMING PRODUCTION FORESTRY

- SUSTAINABILITY OF THE TRADITIONAL WOOD PRODUCTION MODEL
- SHIFT IN THE MAIN STACK-HOLDERS
- FARMERS-THE MAIN WOOD GROWERS
- PRIVATE SECTOR ALSO A KEY PLAYER
- SHIFT IN LAND USE FOR WOOD PRODUCTION
- PRODUCTION FORESTRY BEING REDEFINED
- FORESTS ARE BETTER REGARDED FOR ENVIRONMENTAL VALUES

SOURCES FOR WOOD AVAILABILITY

- FOREST AND TREE COVER: 21%(69.1 Mha)
- TREE COVER (ToFs) OVER 3%
- EFFORTS FOR ADDITION OF 33.6 Mha FOR ACHIEVING 33% TARGET
- EFFORTS TO INCREASE TREE COVER IN AGRO-FORESTRY
- IMPORTS
Forests in Society

[305x38]Forests in Society

NFP FEATURES : SOCIAL FORESTRY (PARA 4.9)

• Farmers, particularly small & marginal farmers, would be encouraged to grow, on marginal/degraded lands available with them, wood species required for industry.

NFP FEATURES : FOREST BASED INDUSTRY (PARA 4.9)

• As for as possible, FBI should raise the raw material needed for meeting its own requirements, preferably by establishing a direct relationships between the factory & individuals who can grow the raw material by supplying the individuals with inputs including credits, constant technical advice & finally harvesting & technical services.

NFP FEATURES : SUPPLY OF RAW MATERIAL TO FBI

• The practice of supply of forest produce to industry at concessional price should cease.

• New units to make own wood arrangements

ESTIMATED WOOD AVAILABILITY

• 1-2 Mm$^3$ timber from government forests
• ????? firewood from government forests
• 5-6 Mm$^3$ from imports
• Rest ???????

CONSUMPTION OF WOOD & WOOD PRODUCTS (FAO REPORTS)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>FIREWOOD</th>
<th>IND. WOOD</th>
<th>SAWN TIMBER</th>
<th>WB PANELS</th>
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### NAP Features: Mentions

- **Growth based on efficient use of resources and conserves our soil, water and biodiversity**
- **Growth that is sustainable technologically, environmentally and economically**

### NFP Features: Social Forestry

- **The above considerations, will however, be subject to the current policy relating to land ceiling and land laws.**

### NFP Features: Forestry Research in Pvt Sector

- **NFP 1988 (Para 4.12) deals with the forestry research in government sector, no mention that of private sector research.**

### NFP Features: On Inventory

- **NFP (Para 4.14) on forest survey and data collation**
- **Periodical collection, collation and publication of reliable data**

### NFP Features: On Social Forestry

- **The above considerations, will however, be subject to the current policy relating to land ceiling and land laws.**

### Land Holdings for Some Major Uses Defined

- **Agricultural crops**
- **Horticultural crops**
- **Plantation crops like tea, rubber etc..**
- **Forestry plantations???**
EXPECTATIONS FROM THE NEW POLICY

- FOCUSED
- REALISTIC
- STACK HOLDERS ORIENTED
- ATTAINABLE/ RESULT ORIENTED

WAY FORWARD

- OVER POPULATION AND LAND DEFICIT SCENARIO CALL FOR INTEGRATED LAND USE POLICIES AND PROGRAMMES
- POLICY AND INSTITUTIONAL FRAMEWORK NEEDS TO DRAW SUPPORT FROM THE EXPERIENCE & LESSON LEARNINGS FROM INTEGRATED PROJECTS

NEED INCORPORATIONS OF LATEST COMPONENTS

- LIMITATIONS OF METHODOLOGIES FOR A&R PROJECTS AND FSC CERTIFICATIONS OF FOREST PRODUCE
- LIMITATIONS IN TRADE OF NON-FOREST AREA GROWN FOREST PRODUCE

OVERLAPPINGS & CONTRADICTIONS

- CULTURE, EXTENSION & MARKETING SUPPORT, FOR EXAMPLE:
- BOTH MANDI AND FOREST REGULATIONS SIMULTANEOUSLY ON THE TREE PRODUCE OBTAINED FROM THE FARMS
- AGRICULTURE V/S. FOREST PRODUCE
- LINKAGES: LINE DEPARTMENTS/LAND REGULATIONS/NEW CHALLENGES
- LAND CAPABILITY CLASSIFICATION
- MARKETING REGULATIONS

AGRONOMICALLY COMPATIBLE

MULTITIER: POPLAR + WHEAT + SAPOTA
EXPECTATIONS FROM THE INSTITUTIONAL FRAMEWORK

• MUST HAVE AN AUTHORITY
• MUST BE REPRESENTED BY THE ACTUAL STACKHOLDERS
• AN EXCELLENT OPPORTUNITY FOR PPP MODEL
For a city to be sustainable, it must have adequate open spaces, clean air, and a wholesome environment flanked by trees, meadows, stream and opportunities for recreation and social gathering. If cities are to be sustainable, they must be designed using native plant materials and natural processes that will stand up to time and temptation of age to weather and fail.

-Frederick Law Olmsted (1822-1903)

“Urban forestry does not deal entirely with city trees or with single tree management, but rather with tree management in the entire area influenced by and utilized by urban population”

Jorgensen, 1970

Urban forestry…. is the art, science, and technology of managing trees and forest resources in and around urban ecosystems for the psychological, sociological, economic, ecological, and aesthetic benefits trees provide society.”

- The Dictionary of Forestry

J.A. Helms, ed. 1998

"Expanding Urban Forestry in India: Present Scenario- Issues, Challenges and Opportunities”

SUBHASH CHANDRA, IFS
Urbanization

- Growing urbanization-a reality, cities are expanding as never before
- Urban population more than the total population of Russia+ Canada +Australia
- Growth of rural population 12.18% in the same period.
- Asia will have 17 out of 27 World’s largest Megacities in 2015
- In 1901, only 1 out of 9 Indian lived in Cities. (total urban population: 26m)
- In 1991, 1 out of 4 Indian is in cities
- 42 Cities have more than 1 Million Population in 2010. Projected 68 Cities in 2030.
- 2/3rd of Indian Population lives in Class I Cities (more than 1 lakh population)
- Kolkata, Chennai, Greater Mumbai, Hyderabad, Delhi, Chandigarh, Pune, Bangalore, Ahmadabad and Kanpur most populous cities account for more than 7-8 % of the country’ population.
- By 2030, it is estimated that 40% of India’s population will reside in cities.

Hyderabad - founded in 1591 - Md. Quli Qutub Shah, 5th sultan of Qutub Shahi dynasty

- GHMC - about 650 sq. kms - population about 4.5 million.
- HMDA area 2200 Sq.kms; Population 5.7 million
- Hyderabad is the Fifth largest urban agglomeration in India.
- Population density is 17000 per Sq.km.

India & Urban Greenery

- 27.8% live in urban India.
- 6 Mega cities (4 M +)
- 35 Metropolitan cities(1 M +)
- 393 Large towns (0.1 M+)
- 5,784 small and medium towns (<0.1 M).

- In the context of carbon offsets, green open spaces required in urban areas to provide shade and insulation to buildings.
- Urban green open spaces play a vital role in the amelioration of urban environment.

Urban forests comprise trees in and along...

- Streets
- Parks (passive)
- Recreation areas (active)
- School yards
- City greens
- Power-line right-of-ways
- City forests/ woodlands
- Landfills
- Riparian zones etc.

Urban forestry includes . . .

- Forestry
- Arboriculture
- Landscape architecture
- Land use & urban planning
- Horticulture
- Public policy & administration
- Soil science
- Spatial ecology & information

Urban Forests include Parks, Gardens, Avenues, Woodlands/ City forests, Green belts and diffused tree population etc. and provide significant environmental and material benefits.

Eco-restoration & conservation of lake in Banjara Hills

1999
A dying water body - in 15 acres
- Grazing ground
- Swimming pool for the poor
- Hunting ground for the birds
- Garbage & sewerage dumping
- Dhobi-ghat

Now
Forests in Society

Chandigarh

- 2nd smallest UT/State: 114 Km (Lakshadweep: 32 Sq Km)
- 2nd Most densely populated UT/State: 7900.3 /sq Km (Delhi: 9339.5 /sqKm)
- 2nd Lowest Sex Ratio: 777 / 1000 males (Daman & Diu: 710)
- Area: 78 Sq km (total including rural: 114 sq km)
- 56 rectangular sectors including 2 industrial areas (First Phase: 1-30 and remaining in second Phase)
- Each sector measures 246 acres (1200 x 800 m)
- Population: 9,00,914 (Designed for 3 lac people)
- Total Population density: 7903/km² (2nd highest in States & UTs)
- Urban Population density: 10194 persons/km²
- Floating population: > 3 lacs daily
- State owned Forest cover: 35.75%
- Private forests: nil
- Total Ann. Rainfall: 111 cm
- Temp. range: 6.7 – 44.2°C
- Motorised vehicles: 6.5 lac/per capita maximum in the country

Delhi: The Green Capital

Delhi is one of the greenest metropolitan cities in the world with more than 20% under permanent green cover.

Sir Edwin Lutyen’s plan for New Delhi was based on the Garden city concept, with one-third area as greens, which was prevalent in Europe. Lutyen’s plan for New Delhi was based on the Garden city concept, with one-third area as greens, which was prevalent in Europe.

Banabitan Park

- AREA: 58 ACRES
- Water body: 16 ACRES- remnant of E. Kolkata wetlands
- SALT LAKE – KOLKATA HEART OF KOLKATA, OFFICE COMPLEXES
- YEAR OF CREATION: 1992
- NO. OF VISITORS IN A YEAR: 6.7 LACS
- CENTRAL WATERBODY WITH RESIDENTIAL BIRD, MAMMALS, REPTILES, FISH BUTTERFLY POPULATION
- HERBAL GARDEN, MODERN NURSERY, CHILDREN PARK, BUTTERFLY PARK, GUEST HOUSE, SALE COUNTER FOR SEEDINGS, NTFP, FAMILY SRC, WATER BODY - 9 MAJOR SECTIONS
- MORNING WALKERS, YOGA GROUP

Kolkata

- Butterfly- 75 major species
- Birds- 80 major species
- Nontropical plants: 100 species
- Shrubbery & trees: 220 species
- Small mammals- 12 species
- Reptiles- 12 species
- Fishes- 15 species
- Insects- 12 species

Banabitan Park

NTR Garden

NEW DELHI

an overview

<< Back to contents
### Comparative Forest Cover of Metropolitan Cities (in sq. km.)

<table>
<thead>
<tr>
<th>CITY</th>
<th>Geo. Area</th>
<th>Forest + Tree Cover</th>
<th>% of Geo. Area</th>
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<tbody>
<tr>
<td>Delhi</td>
<td>1483</td>
<td>176.58</td>
<td>20.20</td>
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<tr>
<td>Mumbai</td>
<td>157</td>
<td>123</td>
<td>20.20</td>
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<tr>
<td>Mumbai Suburban</td>
<td>446</td>
<td>120</td>
<td>26.91</td>
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<td>144</td>
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### Comparative Forest Cover of main Metros/ Cities/ Urbanised Districts (in sq. km.)

<table>
<thead>
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<th>CITY</th>
<th>GEO. AREA</th>
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<th>% OF GEO. AREA</th>
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### Impact of Delhi Metro

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<tr>
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<td>23.21</td>
</tr>
</tbody>
</table>

Contd...

<table>
<thead>
<tr>
<th>CITY</th>
<th>GEO. AREA</th>
<th>FOREST + TREE COVER</th>
<th>% OF GEO. AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patna</td>
<td>3,202</td>
<td>16</td>
<td>0.50</td>
</tr>
<tr>
<td>Guwahati Kamrup Dist</td>
<td>4,345</td>
<td>1,432</td>
<td>32.96</td>
</tr>
<tr>
<td>Ranchi</td>
<td>7,698</td>
<td>1,904</td>
<td>24.73</td>
</tr>
<tr>
<td>Raipur &amp; Dhamtari</td>
<td>16,468</td>
<td>5,469</td>
<td>33.21</td>
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<tr>
<td>Agra</td>
<td>4,027</td>
<td>276</td>
<td>6.85</td>
</tr>
<tr>
<td>Bhutaneswar (Khurda)</td>
<td>2,813</td>
<td>375</td>
<td>13.33</td>
</tr>
<tr>
<td>Thiruvannamalipuram</td>
<td>2,192</td>
<td>1,350</td>
<td>61.59</td>
</tr>
<tr>
<td>Kanpur (Nagar+ Dehat)</td>
<td>6,176</td>
<td>109</td>
<td>1.76</td>
</tr>
<tr>
<td>Mysore</td>
<td>6,854</td>
<td>1,089</td>
<td>15.00</td>
</tr>
<tr>
<td>Amritsar</td>
<td>5,086</td>
<td>29</td>
<td>0.57</td>
</tr>
<tr>
<td>Ludhiana</td>
<td>3,578</td>
<td>63</td>
<td>1.76</td>
</tr>
</tbody>
</table>

<< Back to contents
UPF for Products/Goods:
- Wood/firewood/small timber
- Food: Fruits, leaves, bark, flowers, grasses
- Medicinal products
- Firewood for crematoria
- Water
- Clean Air
- Grazing, livestock support
- Rocks, minerals, soil etc.

UPF for Environmental Services:
- Erosion control: reduce stormwater runoff, flood control
- Soil amelioration, Soil conservation
- Wind break & Shelter belt
- Nature conservation (urban biodiversity- birds, insects, reptiles etc.)
- Climatic influences: moderating climate, providing shade, lower temperature-less use of AC
- Ground water conservation, maintaining water cycle
- Anti-pollution effects, Filter particulate and gaseous air pollutants: dust, black carbon, VOC’s, CO, NOx, SOx, Ozone
- Reduce urban heat island effect
- Reduce CO2 through carbon sequestration in trees and soil.
**UPF for**

Intangible but important (Tertiary) benefits:
- Healthy cities: good environment for growth
- Beautiful cities
- Condition social behaviour, Social cohesion
- Recreational avenues
- Bio-aesthetics: beautiful cities
- Adds value to locality,
- Resilience to natural calamities
- Brings nature into built environment of cities
- Softens the hard surface features comprising modern buildings, roads etc.
- Decongestion of Cities

**UPF for**

Supporting Poor:
- Employment to skilled, semiskilled, unskilled poor
- Food and sustenance to poor
- Recreational opportunities to all, equal access
- Extension of living open spaces to people staying in cramped accommodation,
- Much needed shade in hot summer,
- Awareness/ knowledge about nature to young / students

---

**Urban Biodiversity Conservation**

**Common Birds in Cities**

**UPF for Beautiful Cities**
Forests in Society

Social benefits of Urban Forests

- For better physical/mental health,
- Greens increase recovery rate in a hospital;
- Psychological benefits, de-stressing; Getting away from crowded cities,
- Protecting health of poor from adverse effect of Climate Change,
- Protection from vulnerable weather conditions (heat waves, flood, cold waves, dusty winds etc.),
- Crime reduction - people's involvement in productive work,
- Education - many schools in run under trees.

Functions of urban forests

- Urban forests as a critical part of urban infrastructure,
- Climate Change mitigation
  - Carbon sequestration – GHG removal, Cooling/heating energy efficiency, reduction in emissions
- Climate Change adaptation

Urban forests for climate amelioration

- Abatement of noise and air pollution;
- Mitigate pollution by reducing energy use and carbon dioxide emissions
- Some absorb common pollutants like sulfur dioxide and nitrogen dioxide
- Aid in the removal of airborne particulate
- Bio-filters

Social Benefits

<< Back to contents
CHALLENGES IN GREENING OF URBAN AREAS

- Difficulties in long term planning, frequent change of landuse
- Trees vs. developments: Trees occupy extremely valuable space in Cities which comes into conflict with other commercial and infrastructural uses.
- Limited space availability-tree viewed as obstruction to development and become the first causality in the process.
- Lack of integration with planned development: Trees as afterthought not as an integral part of City plan
- Water scarcity
- Poor quality of soil
- High development and maintenance cost
- High public pressure due to high floating population
- Lack of respect, sensitivity and care from society. Young saplings prone to vandalism

5. Overall City Economic through Tourism
   - No. of Tourists attracted
   - Distance travelled and days spent
   - Number of Homes Located within 500 Feet of Parkland
   - Quality of Parks

7. Overall City Value Appreciation through Gain in Social Capital
   - Donations to Park Charities
   - Donations of Time and Volunteer Labour

How Much Value Does a City Receive from its Urban Forests System?

1. Environmental Value through Cleaner Air
   - Number of Trees
   - Percent of Tree Canopy

2. Environmental Value through Cleaner Water
   - Percent of Tree Canopy
   - Type of Soil
   - City Cost for Stormwater Management

3. Resident Value through Direct Use
   - Number of Users
   - Types of Uses
   - Value of Each Use on the Open Market

4. Resident Value through Improved Health
   - Amount of Active Recreation
   - Age Distribution of Park Users
## Identification of Cities & Institutions

### Cities
- **I Phase**: Cities with Population of over 1 m
- **II Phase**: Cities with population > 0.5 m – 1 m
- **III phase**: Cities with Population > 0.1 m- 0.5m

### Institutions & Local Bodies, RWAs etc:
- **Municipalities**
- **Cantonment Boards**
- **Central & State institution having land**
- **Farmers/ departments for Nursery creation**

## Approaches

**Urban Greening different form normal forestry:**
- Focus is on individual or group of trees
- Intensity of maintenance and skill is high
- Combination of trees, shrubs, lawns, ground covers, climbers, hedges used for maximizing bio-aesthetics
- Choice of species is important in view of limited land. Needs innovative approach.
- Multiplicity of agencies and stakeholders.

### Interventions
- Support afforestation in-
  - Recorded or notified forest areas.
  - Open spaces/ green spaces like parks & gardens, city forests, etc.
  - Creation of new Parks/ Greens.
  - Diffused planting in avenues, central verges, roundabouts, drain-sides, colony parks, households, water bodies etc.
  - Institutional lands, schools/ colleges/Universities, business/ industrial, residential colonies etc.
  - Appropriate cost norms for plantation & maintenance.

### Strategies.....
- Identification of lands-Land availability limited due to high real estate value.
- Engagement of multi-institutions/ organizations. Role institutions like Municipality, cantonment Board, Development Authority, Corporate sector very important
- Bringing Development of Greens a new component in Plans under JNNURM.

## Strategies...
- Creation of Nurseries to provide good quality planting stock with for holistic greening.
- Garden and avenue designing, Green Corridors & Strips in the City development Planning.
- Incorporation of Tree Conservation Areas in City Plans
- Integration with buildings, parking & other facilities.
- Tall planting. Planting trees in movable planters.
- Tree Management. Need for Arboriculturist, Tree Surgeons. R&D for Proper Management of Trees
- Preparation of Proper Maintenance Protocol.
- MoUs with other organizations for greening.

## Approaches
- Increase in tree density in Parks: try to increase tree canopy in parks to around 0.5 %
- Upto 0.5 acres: trees in groups and corners
- From 0.5 -1.0 acres: trees along boundary & in groups
- Between 1.0 acre > 5.0 acres: trees along boundary, groups and along footpaths
- Above 5.0 acres: woodlands component Block planting
- Planting of mix of Suitable tree spp. Like Bel, Amla, Jamun, Anjeer, Khirni, Banyan, Neem, Peepal, Pilkhan, Gular, Mango, Arjun, Dhak, Gulmohur, Amaltas, Bahera, Khirni, Mahua, Imli etc.
- Mix of Trees, shrubs, climbers, topiaries,hedges etc. to create holistic greens.
Interventions

- Mission to Support afforestation in-
  - Recorded or notified forest areas
  - Open spaces/ green spaces like parks & gardens, city forests, etc.
  - Creation of new Parks/ Greens
  - Diffused planting such as on avenues & central verges, roundabouts, along drains, colony parks, households, water bodies/ ponds etc.
  - Institutional lands, schools/ colleges/Universities, business/ industrial, residential colonies etc.
  - Appropriate cost norms for plantation & maintenance.

Approaches

- Increase in tree density in Parks: try to increase tree canopy in parks to around 0.5 %
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CHALLENGES IN GREENING OF URBAN AREAS

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- Limited space availability-tree viewed as obstruction to development and become the first causality in the process.
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- Water scarcity
- Poor quality of soil
- High development and maintenance cost.
- High public pressure due to high floating population
- Lack of respect, sensitivity and care from society. Young saplings prone to vandalism

Present Scenario

- Cities are loosing trees and greens due to development process. Situation same in all cities.
- Planners are not concerned.
- Open spaces facing completion from other uses
- People loosing cultural attachment with trees
- Difficulties in growing trees as young saplings are damaged frequently
- Limited species are planted to ensure survival
- Staff is ageing in greening agencies.

GREEN INDIA MISSION

SUB: MISSION- 3: ENHANCING TREE COVER IN URBAN/ PERI-URBAN AREAS

- Coverage : 0.20 m Ha
- Total Cost: 2000 Crores
- Needs: Growing urbanization & providing ecological services & amenities to people in cities

Urban Population:

- Present: 310 million
- By 2030: 40% of Total Population
- By 2045: Around 800 Million

- Mix of Trees, shrubs, climbers, topiaries, hedges etc. to create holistic greens.

- Staff is ageing in greening agencies.

- Water scarcity
- Poor quality of soil
- High development and maintenance cost.
- High public pressure due to high floating population
- Lack of respect, sensitivity and care from society. Young saplings prone to vandalism
### Strategies.....

- Land availability limited due to high real estate value less private initiatives expected.
- Role of State & Local Govt. & institutions like Municipality, cantonment Board, Development Authority, PWDs, CPWD, Horticulture Deptt., RWAs, NGOs, Builders, corporate sector, important
- Identification of lands
- Engagement of multi-institutions/ organizations.
- Bringing Development of Greens a new component in Plans under JNNURM

### Strategies ...

- Creation of Nurseries to provide good quality planting stock of large no of tree / shrubs and other plants spp for holistic greening.
- Conservation and care of existing trees
- Garden and avenue designing, Green Corridors & Strips in the City development Planning.
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**Cities**

- I Phase: Cities with Population of over 1 m
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- III phase: Cities with Population > 0.1 m- 0.5m

**Institutions & Local Bodies, RWAs etc:**

- Municipalities
- Cantonment Boards
- Central & State institution having land
- Farmers/ departments for Nursery creation

### Ideas for People’s support

- Biodiversity Parks
- Botanical Gardens
- Butterfly Parks
- City Forests
- Theme Parks like Nakshatra Garden
- Heritage parks
- Archeological Parks
- Sacred groves
- Smriti Van
- Tree conservation areas etc.

### Support from the GIM

As land with Forest Department is limited in urban areas what should be role of Forest department? FDs can provide:

- technical support
- supply Plants
- financial scheme based support
- create favorable regulatory framework to support private initiatives
- awareness and publicity for participatory approach
- creating Employment opportunities for urban poor youth in plantation efforts and maintenance of Greens

### Policy Support

- Integration of existing woodlands as Master plan greens in expansion of Cities or in creation of new Suburbs.
- Policy for conservation of urban greens & trees.
- Focus on individual tree
- 20-33% area to be made green compulsorily in new housing, industrial or other projects.
- Obligatory role of citizens for supporting tree preservation and incentives for plantation may be through concessions/ rebate in property tax.
Selection criteria for species

- Climatic factors: Forest / soil type; water scarcity
- Environmental Factors: Pollution tolerant, hardy,
- Evergreen/ Semi-evergreen versus deciduous species: shade in summer & leaf fall in winter.
- Water requirement: less / or more water in initial years, lowering of water table makes it difficult for trees to absorb water from sub soil.
- Average life of a tree spp.
- Shade/ Flowering or ornamental species
- Height of trees; large/ tall trees make adjoining buildings/ traffic vulnerable for damage in storms etc.

Selection Criteria......

- Shape/ form of tree, branching pattern
- Foliage/ canopy characteristics; requirement of frequent pruning
- Strength of timber/ wood; soft or hard stem branches; frequent breaking of branches
- Strong Root system
- Horticulture waste management/ burning of leaves/ composting
- Growth pattern: slow/ fast growing
- Single tree species/ combination of trees
- Flowering/ fruting pattern
- Retention time/ rotation of trees

Selection criteria....

- Trees as single or in groups of single or multiple spp.
- Trees to be of year round interest based on texture and pattern of leaves, bark, branching patterns, seasonal change of leaf colour, flowering and fruiting etc.
- Trees can be used in built up areas to soften the hard outlines of building and roads, screening of service areas and car parking.
- Trees can heighten the sense of enclosure and perspective, creating the impression of more and less space.
Assessment of Tree Health along Trevor Road, New Forest, Dehradun: A Case Study

By
Kavita and Dr. N.E.K. Dhar

Forest Pathology Division
Forest Research Institute
Dehradun

Forests in urban landscape

Occurrence:-
- along railway lines,
- along canal banks,
- along tank bed and
- along road sides etc

Benefits:-
- Productive viz. timber, fuel, NTFPs etc.
- Protective viz. earth’s air purifier, climate amelioration, soil and water conservation, wildlife habitat etc

Objectives

- Study of all the defects and diseases of trees on the Trevor Road
- Biotic and abiotic factors which affect the tree vigour
- Categorization into various hazard tree categories on the basis of study
- Suggestions to improve the condition of Road side plantation

Methodology Used

- Selection of Study Area i.e. Trevor Road, FRI, New Forest
- Division of road into three sections i.e. Section “A” from Shatabdi dwar to Wilmot crossing, Section “B” from Wilmot crossing to Hart Road crossing and then Section “C” from Hart Road crossing upto Hill Road
- Numbering of trees of left and right hand side separately from shatabdi dwar.

Contd.

- Twenty five sub-factors under three main factors viz. types of defects, soil conditions and human interference were taken for study.
- Types of defects include dead tree or branches, diseased tree, root problems, cracks, weak branch union, poor architecture and epiphytes
- Soil conditions were studied on the basis of soil grade and compactness.
- Foot/vehicle trampling, electricity wiring, nails around branches, domestic wastes, pole and trenches within the protected root zone suggests the human interference

25 factors and result table
**Results**

**Summary of results of Section “A”**

Tree species and their numbers:

<table>
<thead>
<tr>
<th>Name of Sporophore</th>
<th>No of Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grevillea robusta</td>
<td>29</td>
</tr>
<tr>
<td>Syzygium cuminii</td>
<td>10</td>
</tr>
<tr>
<td>Bambusa vulgaris</td>
<td>4</td>
</tr>
<tr>
<td>Terminalia arjuna</td>
<td>2</td>
</tr>
<tr>
<td>Mangifera indica</td>
<td>3</td>
</tr>
<tr>
<td>Terminalia catappa</td>
<td>3</td>
</tr>
<tr>
<td>Grevillea robusta</td>
<td>1</td>
</tr>
<tr>
<td>Terminalia tenuissima</td>
<td>1</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
</tr>
</tbody>
</table>

**Distribution of decay fungi in Section “B”**

<table>
<thead>
<tr>
<th>Tree Species</th>
<th>Number of Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eucalyptus</td>
<td>28</td>
</tr>
<tr>
<td>Grevillea</td>
<td>27</td>
</tr>
<tr>
<td>Bambusa</td>
<td>3</td>
</tr>
<tr>
<td>Adenanthera</td>
<td>2</td>
</tr>
<tr>
<td>Litsea</td>
<td>1</td>
</tr>
<tr>
<td>Ficus</td>
<td>1</td>
</tr>
<tr>
<td>Bambusa</td>
<td>1</td>
</tr>
<tr>
<td>Grevillea</td>
<td>1</td>
</tr>
</tbody>
</table>

**Distribution of decay fungi in Section “C”**

<table>
<thead>
<tr>
<th>Name of Sporophore</th>
<th>No of Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phellinus caryophylli</td>
<td>2</td>
</tr>
<tr>
<td>Phellinus durinimus</td>
<td>1</td>
</tr>
<tr>
<td>Polyporus xanthopus</td>
<td>1</td>
</tr>
<tr>
<td>Hexagonia</td>
<td>1</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
</tr>
</tbody>
</table>

**Hazard category wise tree distribution**

<table>
<thead>
<tr>
<th>Category</th>
<th>No. of Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Hazard</td>
<td>25</td>
</tr>
<tr>
<td>Moderate Hazard</td>
<td>27</td>
</tr>
<tr>
<td>Low Hazard</td>
<td>33</td>
</tr>
</tbody>
</table>

Value of correlation coefficient between $H:G$ and $HC=0.0405$

**Summary of Section “B” Trevor Road**

<table>
<thead>
<tr>
<th>Tree Species</th>
<th>Number of Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eucalyptus</td>
<td>25</td>
</tr>
<tr>
<td>Grevillea</td>
<td>27</td>
</tr>
<tr>
<td>Bambusa</td>
<td>6</td>
</tr>
<tr>
<td>Adenanthera</td>
<td>2</td>
</tr>
<tr>
<td>Litsea</td>
<td>1</td>
</tr>
<tr>
<td>Ficus</td>
<td>1</td>
</tr>
<tr>
<td>Bambusa</td>
<td>1</td>
</tr>
<tr>
<td>Grevillea</td>
<td>1</td>
</tr>
</tbody>
</table>

**Hazard category wise tree distribution**

<table>
<thead>
<tr>
<th>Category</th>
<th>No. of Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Hazard</td>
<td>26</td>
</tr>
<tr>
<td>Moderate Hazard</td>
<td>23</td>
</tr>
<tr>
<td>Low Hazard</td>
<td>17</td>
</tr>
</tbody>
</table>

Value of correlation coefficient between $H:G$ and $HC=0.591$

**Summary of section “C” of Trevor Road**

<table>
<thead>
<tr>
<th>Tree Species</th>
<th>Number of Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syzygium</td>
<td>44</td>
</tr>
<tr>
<td>Lagerostema</td>
<td>23</td>
</tr>
</tbody>
</table>

**Hazard category wise tree distribution**

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Hazard</td>
<td>31</td>
</tr>
<tr>
<td>Moderate Hazard</td>
<td>29</td>
</tr>
<tr>
<td>Low Hazard</td>
<td>13</td>
</tr>
</tbody>
</table>

**Relationship from the Height-Girth Ratio and Hazard Category:**

- Height: Girth ratio range
  - 6 – 11
  - 11 – 14
  - > 14

- Hazard category
  - ‘1’ or ‘2’
  - ‘3’

Value of correlation coefficient between $H:G$ and $HC=0.591$

Only 3 trees out of 73 are with height-girth ratio greater than 15
As all the trees whether they are in hazard category 1, 2 or 3 are potential hazards for the life and property and the only way to completely eliminate a tree hazard is its removal. Complete removal of all the trees is not acceptable; moreover it is also not sustainable. However, trees of hazard category “1” should be replaced immediately as they are the trees facing maximum number of problems with severe decay and for hazard category “2” and “3”, preventive and remedial measures should be applied.

Preventive measures:

During construction of roads, walls, trenches for cabling and drains near the trees they are commonly exposed to following injuries:
1. Stem wounds
2. Root Wounds
3. Fill

To avoid all these problems, design and construction should be carefully planned to avoid tree damage. Soil mounding around the tree bases should be levelled. Grass cutting near the tree bases need to be done carefully.

Remedial measures:

- Policy decision for removal of trees in hazard category ‘1’ and/or their treatment should be worked out. New plantation need to be carried out with proper planning, spacing and suitable species as replacement. Take people into confidence for removal of trees and branches to avoid queries, petitions and explanations.
- Proper pruning followed by wound dressing can take care of large dead branches and tops of the trees which are having poor architecture because of large branches. Canopy reduction is also advisable for the trees affected by root diseases and stresses. This will maintain the balance of the canopy and the roots.

Conclusion

The health status and condition of trees growing along Trevor road in New Forest campus, Dehradun have been assessed and it was found that the trees are showing different hazard categories, as many as 75 trees are falling in hazard category “1” and 90 trees are in category “2”. Various biotic and abiotic stresses have been attributed to the condition of trees. Preventive and remedial measures have been recommended which need to be applied immediately to check for the deterioration of the condition of trees.

Acknowledgements

> I offer my sincere gratitude and personal regards to my competent and reverent supervisor Dr. N. S. K. Harsh, Scientist F, Head of Forest Pathology Division of F.R.I Dehradun, for judicious leadership, valuable discussions, extensive ideas, constructive criticism, constant encouragement support during the entire period of my work.

> I owe my gratitude towards Dr. Amit Pandey, Dr. Parthsarthi Mohanty, Ms. Pooja Arya, Ms. Shalija Rawat & Ms. Sona Singh for their help in GIS lab.

> I am also thankful to all my friends for their constant support.

> I am pleased to express my grateful thanks towards the persons who met me in every morning during my work, took interest and appreciated specially Mr. R. V. Singh, Retired Director General of ICFRE, and Mr. Vijay Rawat, IFS.

> And ultimately I wish to thank almighty ‘God’ supreme power of Universe.
Air layering: A technique for creating urban landscape

Kshitij Malhotra*, Dinesh Kumar and V.R.R. Singh
Silviculture Division, Forest Research Institute, Dehradun
* rishipop@gmail.com

1st Indian Forestry Congress
1st Indian Forestry Congress

Theme: Forest in Society
Sub theme: Forest in Urban Landscape

- India’s population has crossed **1.2 billion**
- More than half of this population lives in urban areas, and the number is growing rapidly

- If scientists want to help the majority of the population, they need to turn their attention to urban areas. (Nature, 2010, Vol.467:883-884)

Major constraints in urban plantations

- **Poor soil fertility**
- **Drought conditions**
- **Inadequate infrastructure for propagation**
- **High planting cost**
Dilemma of Urban People

• How can I grow a plant?
• Where can I grow?
• I do not have enough time for daily inspection
• But, still I want to grow and plant a tree and give my contribution to conserve this beautiful planet

Answer: Air Layering

• Marcottage or gootee (presently used)
  – Action: Remove bark around the branch
  – Limitation:
    • Need specialised training
    • More laborious and time consuming
    • High cost of production
    • More chances of harm to plant
    • Hence, used in difficult to root plants only
• Tourniquet technique (rarely used)
  – Action: A branch tied with wire
  – Limitation:
    • More laborious and time consuming
    • Applied to only hard branches
    • Damage to plant during application

Contd..

Rooter Strand

• It is a novel and GREEN-PRODUCT

• Rooter Strand has been successfully used in those species where cuttings failed to root i.e. difficult to root species e.g. Zanthoxylum alatum Roxb., Santalum album L.

• Rooter Strand has been tested in more than 20 species with success.

Rooter Strand used in various species...

Rooting pattern in different spp. with Rooter Strand
Now you can start TREE REVOLUTION & give your contribution to conserve nature through urban plantation by AIR LAYERING with Rooter Strand

Thanks

Future Applications

- This simple technique can be used in large scale plantation programmes of Govt. of India: GIM, CAMPA, National Biodiesel Mission, MNREGA etc.
- Employment to landless people in urban areas
- Superior germplasm can be multiplied by this technique for increasing productivity in future plantations programmes. For this purpose, it needs to be tested in more species

Importance of Present Technique

- Air layering is very easy and does not require much skilled workers.
- No need of land for nursery or mist chamber.
- Plants can be propagated in natural environment even in remote areas (in FOREST or URBAN fields).
- Sustaining plant biodiversity and reduce monoculture.
- Not much time consuming as in previous techniques of air layering.
- It is a cost-effective method for producing true-to-type plant material and can be adopted for multiplication of superior material where cuttings root poorly.

Results

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of species</th>
<th>Rooter Strand No.</th>
<th>Rooting percentage</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Artocarpus heterophyllus Lam.</td>
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<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Citrus maxima (Burm.) Merr.</td>
<td>1</td>
<td>45</td>
</tr>
<tr>
<td>3</td>
<td>Diplotenia hutuaceae (Roxb.) H. J. Lam.</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>Elaeocarpus ganitrus Roxb. &amp; G.Don.</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>Ficus palnata Forsk.</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>Ficus recession L.</td>
<td>2</td>
<td>90</td>
</tr>
<tr>
<td>7</td>
<td>Gardenia jasminoides Ellis.</td>
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<td>100</td>
</tr>
<tr>
<td>8</td>
<td>Hibiscus rosa-sinensis L.</td>
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<td>80</td>
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<tr>
<td>9</td>
<td>Hybrid Citrus</td>
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</tr>
<tr>
<td>10</td>
<td>Litchi chinensis Sonn.</td>
<td>5</td>
<td>60</td>
</tr>
</tbody>
</table>

Results

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of species</th>
<th>Rooter Strand No.</th>
<th>Rooting percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Nerium oleander L.</td>
<td>1</td>
<td>87</td>
</tr>
<tr>
<td>12</td>
<td>Pongamia pinata (L.) Pierre</td>
<td>1</td>
<td>87</td>
</tr>
<tr>
<td>13</td>
<td>Populus deltoides Butr. ex Marshall</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>14</td>
<td>Pratium guajira L.</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>15</td>
<td>Lagerstroemia indica L.</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>16</td>
<td>Jatropha curcas L.</td>
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<tr>
<td>17</td>
<td>Cassia angustifolia Vahl.</td>
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<td>18</td>
<td>Santalum album L.</td>
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<td>19</td>
<td>Simaruba glauca DC.</td>
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</tr>
<tr>
<td>20</td>
<td>Zanthoxylum alatum Roxb.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This is perhaps one of the best plant propagation techniques in the world which requires HALF GLASS OF WATER

<< Back to contents
Now you can start TREE REVOLUTION & give your contribution to conserve nature through urban plantation by AIR LAYERING with Rooter Strand

Thanks
"Forest Sector Challenges: Need for Forestry Institutions to adapt"

Presentation at the Indian Forestry Congress
At Delhi, India 23rd November 2011

Theme 1: Forests in Society

Sub-Theme 1.3: "Forest Governance and Institutional Reforms"

Dr. Arvind Boaz
Additional Principal Chief Conservator of Forests
CHHATTISGARH

FORESTRY-THE CURRENT SCENARIO:

- FORESTRY SECTOR HAS LITTLE SAY AT POLITICAL, BUREAUCRATIC, OPINION LEADERS AND PRIVATE SECTOR AND EVEN THE COMMUNITY LEVEL.

- ISOLATED AND SIDELINED: INSPITE OF SUCH A BIG EMPHASIS ON THE ENVIRONMENT, THE FORESTRY SECTOR IS STILL ISOLATED AT THE NATIONAL AND STATE LEVEL IN POLICY, PLANNING AND BUDGET ALLOCATIONS. IN SEVERAL KEY ISSUES LIKE BIODIVERSITY, TREES OUTSIDE FORESTS, BAMBOO AND FOREST BASED POVERTY REDUCTION, ENERGY AND NTFPS THE FORESTERS ARE LARGELY SIDELINED.

- FORESTRY AND WILDLIFE AGENDA HIGHLY HIGHJACKED BY NGO’s, CSO’s, VARIOUS INSTITUTIONS, ENVIRONMENTALISTS OUTSIDE THE FORESTRY SECTOR ESPECIALLY IN THE NEW CLIMATE CHANGE REGIME.

- FAILING TO ADAPT: FORESTERS EXTREMELY RIGID IN THEIR APPROACH TO ADAPT TO CHANGE. ARE ALSO SHY OF UPGRADING KNOWLEDGE ABOUT VARIOUS OTHER SECTORS AFFECTING FORESTRY ESPECIALLY VARIOUS POLICIES AND STRATEGIES LIKE POVERTY REDUCTION, ECONOMIC GROWTH, FOOD AND ENERGY SECURITY. ALL THESE POLICIES ARE IN A CONSTANT STAGE OF FLUX AND WE NEED TO KEEP PACE WITH THE CHANGING SCENARIO.

- FORESTERS ARE ALSO NOT READY TO ADOPT NEW TECHNOLOGIES THAT ARE BEING DEVELOPED AROUND THE WORLD EVEN IN FORESTRY. THIS RESISTANCE TO CHANGE AND CONTENTMENT IN THE PRESENT STATUS QUO HAS LEFT THE INDIAN FORESTRY SECTOR WAY BEHIND IN THE PRESENT NATIONAL AND WORLD SCENARIO.
Forestry Institutional challenges

- Great National and International concerns about the environment & forest degradation
- India’s galloping economic growth, globalization, growing disparities in resource allocation, resource conflicts, rapid diversion of forest land for development
- Marginalization of public forestry Institutions
- Rapid Entry of new Vocal players in the sector
- External experts, NGOs and CSOs
- Role of foresters in forest policy level decisions minimised
- Challenging scenario -very existence of public forestry institutions threatened

Forestry Institutional challenges (contd.)

- Current challenges being often addressed through 19th/20th century organizational structures and institutional mechanisms
- Forestry institutions largely myopic in outlook, limited in scope and irrelevant in the face of changes in the external environment.
- Need for better and holistic implementation of Policy. Needs immediate revision to address current challenges
- Shift from traditional ‘command and control’ to coordinate and connect’ mode half hearted and often resisted
- No coordinated communication strategy at National and state level to make stakeholders aware of the work being done and the rewards accruing to society because of this work by foresters in most hostile conditions
Institutional:

Drastic not Cosmetic changes in organizational reforms needed— institutional reforms at all levels are critical for the change processes to attain desired outcomes

Take different stakeholder groups in confidence and work with them to develop and deliver effective strategies. Treat Stakeholders as ‘partners’ and ‘customers’.

Understand the Herculean task through rigorous analyses for designing due change and undertaking reforms.

Accept the changing environment and fight it out by taking the Bull by its Horns. Legislations like PESA, the Indigenous Peoples & Tribal Rights Act, RTI have the power to make forest departments completely irrelevant. Counteract. Drop the ostrich approach, take advantage of the strong environment and forestry sentiment developed in the recent past. Push through strong counter legislations and amendments to these Acts by pro-active education of legislators and people in response.

Stop being timid about change. Once committed, do not adopt a haphazard approach to change for ‘quick wins’.

The Application contd….

Organizational:

Delegate / de-concentrate functions and powers to lower levels

Integrate forestry with development-Implement integrated forest sector strategies based on livelihood and development approaches

Try to work on best practices in human resource management and meritocracy culture

Rules apply to all, irrespective of power brokers. Enforce laws without fear or favor; especially the latter

Review outdated policies seriously -and implement in a time bound serious manner.

Review and change outdated training curricula, methodologies, practices, working plans to suit current needs

The Solution:

- an Enabling Environment for the Practitioners of the forestry Discipline to develop confidence
- Good Governance
- Give Power to People and in turn derive power of the Peoples’ support
- Encourage Specialisation in various streams of Forestry and make yourself wanted
- Become Technical Bridge between people, policy makers, private and public sectors and Cross-sectoral Centres of Excellence on core issues of SFM, MDGs, Climate, democracy and development.

Time to Adapt Quickly to the rapidly changing Environment

Otherwise, the sector is bound to lose its Role and Acceptability in society and may be Perish
FORESTS AND COMMUNITIES FORGING PARTNERSHIPS

Kartikeya V. Sarabhai

1st Indian Forest Congress
New Delhi, November 22nd-25th, 2011.
With the intervention of the VIKSAT Bhiloda Field office the work of regeneration has been done through Tree Growers Cooperative Societies (TGCS) of Bhiloda Taluka of Sabarkantha District.

Total 77 TGCS are formulated. 56 TGCSs are registered under the cooperative society act. Total 7992 hectare area of Forest Land is protected. On regeneration of the degraded forest people are getting Non Timber Forest Produce (NTFP) like the fodder, fuel, Timru leaves etc.
1. Degraded Forest land now better forests but the promise of share in Timber needs to be acted upon. Harvesting long overdue in some cases.

2. FD not competing with NGOs. Need better tools to select partner NGOs. Tendering not appropriate technique.

3. Not to convert JFM committee into a “sub-contractor” for hiring people

4. Carbon credit sharing mechanism

SGP India – Project Impacts

- **Grantee Name**: SRIJAN
- **Project No**: IND/SGP/OP4/Y1/RAF/2008/02/MS 26
- **Project Title**: “Restoration of Forests to Ensure Survival of Kolam – a Primitive Tribe”
- **Grant Amount**: USD 30,833
- **Co-financing**: USD 41,666
  Oxfam scaling up into the district for 15 villages
Tropical Forestry Services (largest Indian sandalwood company) manages the largest area of Indian sandalwood plantation in the world with 3,770 hectares planted in the Ord Irrigation Scheme.
Forests & National Accounts

1. There are estimates of what forests generate for the economy but no valuation of the standing forests and their role in water and soil protection, and certainly no valuation of the minor forest produce, which provides livelihood to the poor.
2. There is no assessment of the role of forests as providers of grazing land, which in turn provide for animal care and dairying.
3. Contribution of this sector—defined as agriculture, forestry and fishing—has sharply declined each year. Its annual growth rate in 2005-06 was 5.2 per cent. By 2009-10 its growth rate turned negative.
4. Place taken by the mining and quarrying sector, which registered a growth rate of 8.7 per cent in 2009-10 against 1.3 per cent in 2005-06.
5. Forests have been blacked out in the economic assessment of the country.”

Sunita Narain in Down to Earth

Cee Campus

Sanjeevani
Explores and diversity education through waste reuse

- Post basic schools – based on Gandhian ideology of education.
- Aushadh Baug - Biodiversity Conservation Resource Area (BCRA)
- More than 150 medicinal plants.
- Focus on dignity of labour and self sufficiency,

Farmer Field Schools

- To demonstrate and facilitate sustainable agriculture practices
- Halvad, Gujarat, 15 field farmer school with a membership of 225 farmers
  - Drip irrigation
  - Organic farming
  - Green manuring
  - Soil and water testing
  - Dry land horticulture
  - Boundary plantation
  - Bio compost
  - Vermi compost, vermi wash
  - Bio pesticide
  - Training and exposure

Source: Rural Knowledge Centre (Halvad), CEE

Paryavaran Mitra

- 2 lakh schools
- Curricular class room programme and
- Eco-club activities

Materials in 15 languages
Key elements of Partnership

- A sense of joint “ownership”
- Participation in Key Decision making
- Sharing of Benefits
- Recognition of larger role of Forests – Ecosystem services
- Transparency and Access
- Value addition possibilities
- Capacity Building
- Weaving in local traditions
- Participation in Monitoring

Student Amateurs in School Yard Agriculture (SASYA) Project

- CEE with the support of UNICEF Hyderabad and the Department of Education (Sarva Shiksha Abhiyan) in 150 schools in the Medak district of Andhra Pradesh, India
- Chemical-free, nutrient-rich vegetables to the children and to provide an opportunity to learn by doing
- A small start-up kit with a manual, guidance, vegetable seeds and other requirements like sample bio-fertilizers, bio-pesticides and equipment like hand sprayers
- A research group formed with a teacher, Mandal Educational Officer and a field coordinator from a NGO
- Village community were part of garden lay out plan, prepared land for sowing, helped sowing seeds, provided farm yard manure and seeds
- Produce utilized for the mid-day meals served in schools and also shared with community as well as the teachers

Public Consultation

- EcoSampark
- College Monitoring Programme

GIM Consultation

Monitoring & Feedback
INTERPRETING MEDICINAL PLANTS IN INDIAN TRADITIONS FOR SETTING CONSERVATION PRIORITIES

D.K. Ved
Institute of Ayurveda and Integrative Medicine,
Foundation for Revitalisation of Local Health Traditions, Bangalore.
November, 2011

What is a Medicinal Plant?

All plants have potential medicinal value. This was recognised more than a 1000 years ago in Ashtanga Hridaya.

'...................................जगत्येवमनोष्णम्
न हिमिद्याते हन्यं नसासावनार्णगोमो' : 

In Ashtanga Hridaya.
Sutra Ch.9 – verse 10, Ashtanga Hridaya.

There is nothing in this universe, which is non-medicinal, which cannot be made use of for many purpose and by many modes.

Profile of India’s Medicinal Plants

- India’s rich medical heritage ….one of the oldest living traditions in the world (> 3000 years old).

- As per FRLHT’s database around 6200 plant species are recorded in medicinal use in India by > 4000 ethnic communities

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**Profile of India’s Medicinal Plants**

Cross tabulation of number of Medicinal Plants Used across Medical Systems

<table>
<thead>
<tr>
<th></th>
<th>AYURVEDA</th>
<th>FOLK</th>
<th>FOLK (V)</th>
<th>HOBBIO</th>
<th>AYURVEDA</th>
<th>TCM</th>
<th>TIBETAN</th>
<th>UNANI</th>
<th>WESTERN</th>
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<td>1539</td>
<td>776</td>
<td>330</td>
<td>176</td>
<td>750</td>
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<td>248</td>
<td>420</td>
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<td>FOLK</td>
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<td>4765</td>
<td>283</td>
<td>161</td>
<td>777</td>
<td>673</td>
<td>187</td>
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<td>FOLK (V)</td>
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<td>547</td>
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<td>300</td>
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<tr>
<td>HOBBIO</td>
<td>176</td>
<td>163</td>
<td>47</td>
<td>490</td>
<td>145</td>
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<td>AYURVEDA</td>
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<td>340</td>
<td>145</td>
<td>6152</td>
<td>289</td>
<td>211</td>
<td>337</td>
<td>59</td>
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<tr>
<td>TCM</td>
<td>359</td>
<td>673</td>
<td>138</td>
<td>129</td>
<td>289</td>
<td>881</td>
<td>109</td>
<td>252</td>
<td>179</td>
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<td>187</td>
<td>82</td>
<td>69</td>
<td>211</td>
<td>109</td>
<td>252</td>
<td>179</td>
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<tr>
<td>UNANI</td>
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<td>532</td>
<td>101</td>
<td>137</td>
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<td>14</td>
<td>102</td>
<td>59</td>
<td>80</td>
<td>23</td>
<td>65</td>
<td>190</td>
</tr>
</tbody>
</table>

Total species: 6248

**Cultural Context**

- India has one of the most mature plant-based medical traditions in the world.
- Sophisticated theoretical foundations (Dravya Guna Shastra) for the study of biological properties and actions of plants.
- 25,000 brilliantly designed herbal formulations in the codified medical tradition (thousands of medical manuscripts).
- 50,000 herbal formulations based on around 8000 species, estimated to be known to folk tradition.

**Economic Context**

- Around 600,000 registered practitioners of Indian systems of medicine whose practice depends on use of medicinal plants.
- Over 9000 manufacturing units with annual turnover >Rs.8000 crores.
- International annual trade in medicinal plants more than a **billion USD**.

**Break – up of Traded Botanicals**

- 41% of these 960 species are herbs, 26% trees, 18% shrubs and 15% climbers.
- More than 50% of plant raw drugs in trade involve collection of whole plants, roots, wood or bark (destructive harvesting).
- 178 Species identified in high volume (>100 MT/Yr.) trade
- Annual demand of botanical raw drugs estimated at 3,19,500 MT (dry wt.)

**Medicinal plants traded in India**

- Out of 8,000 plant species recorded in medicinal use in India, about 1000 species are estimated to be in commercial trade as plant raw drugs.
- Inventory of such species, prepared by FRLHT, based on extensive surveys of plant raw drug markets across the country has listed 1289 botanical entities pertaining to 960 plant species (2006-07)

**Key findings**

- A list of 178 species in high trade (>100MT/Yr.) has been generated based on data of industrial consumption as well as data of production, supply and trade recorded during the study. An analysis of supply sources for these 178 species is given below:
91 wild species, in high trade, needing focused management interventions

- 21 of these are obtained from temperate forests (Himalaya) and 70 from tropical forests.

21 Species obtained from Temperate Forests (Himalayan region): Abies spectabilis (Brahni tall), Aconitum ferox (Bachhag), Aconitum heterophyllum (Alis), Berberis aristata (Darvaldi), Bergenia ciliata (Pushandha), Cedrus deodara (Devdat), Cinnamomum tamala (Tejpatra), Ephedra gerardiana (Somlata), Juniperus communis (Hauber), Jurenea macrocephala (Dhoop), Nardostachys grandiflora (Jatamansi), Onosma hispidum (Ratanjot), Parmelia species (Chadhia), Picrorhiza kurroa (Kukki), Pistacia integerrima (Rakarsangi), Rheum australe (Revanchhun), Rhododendron anthopogon (Talis patra), Swertia chirayita (Chirata), Taxus wallichiana (Talis), Valeriana jatamansi (Mushkala), Viola pilosa (Banafsha).

Some of these species need to be cultivated for meeting the specific quality requirements relating to the plant raw drugs.

46 Species, in High Trade, largely/ entirely obtained from wastelands/ roadsides


Some of these species may need development of improved varieties / Cultivars.

5 Species, in high demand, largely/ entirely obtained through imports

- 2 species, namely Aquilaria agallocha (Agar) growing in N.E India and Commiphora wightii (Guggul) growing in western India, need augmentation of their wild populations and sustainable harvest practices.

- The remaining 3 species, namely Glycyrrhiza glabra (Mulethi), Piper chaba (Gaippal), Quercus infectoria (Majuphal) are exotics and may have to be considered for cultivation in suitable areas for meeting the domestic demand.

Note: A few high value imported species, like Anacyclus pyrastrum, may also be considered for such cultivation.

70 Species, in High Trade, obtained from Tropical Forests of India


Some of these may need development of improved varieties / Cultivars.

36 Species, in high trade, largely/ entirely obtained from cultivation / plantations


Some of these species may need development of improved varieties / Cultivars.

Native traded medicinal species obtainable from specific bio-geographic zones

- From Himalayan region: Aconitum species, Picrorhiza kurroa, Swertia chirayita, Dactylorhiza hatagirea, Nardostachys jatamansi, Valeriana jatamansi, Podophyllum hexandrum, Angelica glauca, Saussurea costus.

- From Western Ghats: Coscinium nevrentorum, Garclinia indica, Hydnocarpus pentandra, Vateria indica, Myristica malabarica.

- From Deccan Peninsula: Decalepis hamiltonii, Pterocarpus santalinus.

- From N.E. India: Aquilaria malaccensis, Coptis teeta, Taxus wallichiana.
India’s Medicinal Plant Diversity is distributed across different forest types (16) / bio-geographic zones (10) / biotic provinces (25) of the country.

Conservation action has, therefore, to take place across these categories.
Conservation context

Estimation of Conservation Status

- Large number of plant species are now believed to be under threat of extinction ……IUCN’s global list of threatened plants (1997) enlists nearly 12.5 % of all known species in this category.

- Using this proportion it is estimated that nearly 1000 medicinal plants of India would fall into this category.

Conservation context

State wise list of medicinal plant species assigned RL status based on Rapid threat assessment exercises (CAMP process)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>State</th>
<th>No. of RLS</th>
<th>Year &amp; Location of CAMP workshop</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Karnataka</td>
<td>81</td>
<td>1995,1996,1997,1999 all at Bangalore</td>
</tr>
<tr>
<td>3</td>
<td>Tamil Nadu</td>
<td>80</td>
<td>1995,1996,1997,1999 all at Bangalore</td>
</tr>
<tr>
<td>4</td>
<td>Andhra Pradesh</td>
<td>47</td>
<td>2001 at Hyderabad</td>
</tr>
<tr>
<td>5</td>
<td>Maharashtra</td>
<td>35</td>
<td>2001 at Pune</td>
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<tr>
<td>6</td>
<td>Chhattisgarh</td>
<td>47</td>
<td>2003 at Bhopal</td>
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<tr>
<td>7</td>
<td>Madhya Pradesh</td>
<td>50</td>
<td>2003,2006 both at Bhopal</td>
</tr>
<tr>
<td>8</td>
<td>Arunachal Pradesh</td>
<td>44</td>
<td>2003 at Guwahati</td>
</tr>
<tr>
<td>9</td>
<td>Assam</td>
<td>16</td>
<td>2003 at Guwahati</td>
</tr>
<tr>
<td>10</td>
<td>Meghalaya</td>
<td>25</td>
<td>2003 at Guwahati</td>
</tr>
<tr>
<td>11</td>
<td>Sikkim</td>
<td>24</td>
<td>2003 at Guwahati</td>
</tr>
<tr>
<td>12</td>
<td>Jammu &amp; Kashmir</td>
<td>62</td>
<td>1998 at Kullu, 2003 at Shimla</td>
</tr>
<tr>
<td>13</td>
<td>Himachal Pradesh</td>
<td>62</td>
<td>1998 at Kullu, 2003 at Shimla</td>
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<tr>
<td>14</td>
<td>Uttarakhand</td>
<td>60</td>
<td>2003 at Shimla</td>
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<tr>
<td>15</td>
<td>West Bengal</td>
<td>43</td>
<td>2007 at Kolkata</td>
</tr>
<tr>
<td>16</td>
<td>Rajasthan</td>
<td>38</td>
<td>2007 at Jaipur</td>
</tr>
<tr>
<td>17</td>
<td>Orissa</td>
<td>48</td>
<td>2007 at Bhubaneshwar</td>
</tr>
</tbody>
</table>

Total no. of species (NT and above) = 335

Conservation context

\[\text{Total no. of species (NT and above) } = 335\]

Conservation context

Estimation of Conservation Status

- Three volumes of Red Data Book of Indian plants (by BSBI) enlist only around 60 medicinal plant species.

- The large gap between this documentation and the estimated 1000 threatened Indian medicinal plants needs to be addressed through a rapid assessment methodology.
Conclusions

- A very large number of medicinal plants in trade are obtained from the wild with implications on their conservation and sustainable utilization.

- This concern has a higher priority for species that are endemic or narrowly distributed and assessed as threatened.

- There is a need to develop management practices for ensuring conservation of these resources as well as meeting the livelihood needs of the large number of collectors involved in harvesting.

Towards Conservation Action

- Enlistment of Wild Medicinal Plants of each state.

- Survey and assessment of species wise collections of medicinal plants from the forests.

- Rapid assessment of prioritized species using CAMP (Conservation Assessment and Management Prioritization) process and following IUCN Red List categories & criteria(2000) for informed conservation action.

- Establishment of a network of 200 to 300 Medicinal Plants Conservation Areas (MPCAs) across different forest types / bio-geographic regions of the country

- Putting in place a suitable policy frame work for supporting the Forestry sector to include medicinal plants conservation, with community participation, as one of the goals of forest management.
Forests and Traditional Knowledge with particular reference to Medicinal Plants

by

B.S. Sajwan
PCCF(HoFF) and Principal Secretary(E&F)
Arunachal Pradesh
Formerly CEO, National Medicinal Plants Board

World Forestry Landscape

- **Forests**
  - Cover more than 4 billion Ha (30%) of landmass
  - Account for more than 5000 commercial products - medicines, clothing etc
  - Are home to 2/3 rd of terrestrial species
  - Provide livelihood to 1.6 billion people
  - Are source of herbs and herbal products which provide health care to almost 80% of population in the developing world
  - Being lost @ 13 million ha every year with about 100 species getting extinct every year

Traditional Knowledge

- **Forms**
  - Folk non-codified
  - Codified, like, Ayurveda

TK is understood as knowledge derived and transmitted outside the boundaries of formal scientific/technical discourse. It is based on practical experience and experimentation involving trial and error, codified to varying degrees. TK is often governed by customs and social conventions making it very widely available. It is not protected today by any legally defined rights.
Traditional Medicine in India

- Officially recognized systems of medicine in India besides the Allopathic system are:
  - A: Ayurveda
  - Y: Yoga and Naturopathy
  - U: Unani
  - S: Siddha
  - Sowa Rigpa
  - H: Homeopathy
  
  In addition there are a large number of folk healers (86,000 MT of consumption) who provide health care but are not part of the formal system of medicine in India.

Medicinal Plants

- For health security
  - 90% of AYUSH products are plants based
  - More than 6,500 plants used in folk and documented systems of medicines
- For livelihood
  - Almost 50% of the household income comes from medicinal plants collection in some forest rich states
- For employment generation
  - 35 million mandays
  - Main source of off season employment
  - 25,000 herbal traders

Medicinal Plants - Overview

- It was estimated that by 2010-11 at least two-thirds of the US population will be using alternative therapeutic approaches.
- More than 1500 herbals are sold as dietary supplements or ethnic traditional medicines
- Growing popularity of Traditional Chinese Medicine (TCM)
- Global acceptance of Ayurveda
- Steep rise in the demand for medicinal plants from India.

Medicinal Plants - Global Scenario

- International market in year 2004 was around $60 billion and growing at the rate of 15%.
- Industry is expected to attain a value of USD 7 trillion by 2050.
- Demand for herbal medicine is especially high in European Union (EU) and United States (US). These two markets are the key driver of global herbal trade.
- Large number of Indian herbs already included in GRAS list and Herbs of Commerce by USFDA

Medicinal Plants – Indian Scenario

- India has 47,000 diverse plant species.
- Flowering Plants about 16,000-17,500
- About 6,500-7,500 plants are known to have medicinal usage and used in traditional systems of medicine in India
- Presently, India contributes less than 1% to the global herbal trade & about 9% of exports
- Large domestic manufacturing sector (>9000 registered units)
- 2/3 of exports as raw herbs/extracts
- 80% of the production sourced from forests and waste lands and only about 40 species from cultivation
Challenges to Medicinal Plants Conservation

- Almost 25% of annual production of medicinal plants is collected by traditional healers for use and dispensing through non-formal health care system.
- Almost 2/3rd of the herbs collected through destructive harvesting. In case of trees the replacement cycle can take 10-15 years.
- Almost a total lack of regeneration program under Forestry sector. Schemes except a weakly enforced regulatory framework.
- Inadequate understanding of reproductive biology and sustainable harvesting system for a number of RET species.
- Long supply chain in trade causing poor returns to primary collectors leading to more collection.
- Almost 1/3rd of herbs collected get rejected by the industries.
- Subsistence collection replaced by commercial collection under influence of market forces.
- Non-destructive harvesting of fruits etc often replaced by destructive harvesting to save labour costs and maximise outputs.
- High usage of substitutes and even adulterants.
- Efficacy and quality of medicines affected bringing the systems into disrepute.
- Adverse impact on of trade and exports.
- Permanent loss of biodiversity and threat of extinction to the rare, endangered and threatened species.

Plant Parts wise usage

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Item</th>
<th>Unit (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Leaves</td>
<td>5.8</td>
</tr>
<tr>
<td>2</td>
<td>Flowers</td>
<td>5.2</td>
</tr>
<tr>
<td>3</td>
<td>Fruits</td>
<td>10.3</td>
</tr>
<tr>
<td>4</td>
<td>Seeds</td>
<td>6.6</td>
</tr>
<tr>
<td>5</td>
<td>Stem</td>
<td>5.5</td>
</tr>
<tr>
<td>6</td>
<td>Wood</td>
<td>2.8</td>
</tr>
<tr>
<td>7</td>
<td>Bark</td>
<td>13.5</td>
</tr>
<tr>
<td>8</td>
<td>Whole</td>
<td>16.3</td>
</tr>
<tr>
<td>9</td>
<td>Rhizome</td>
<td>4.4</td>
</tr>
<tr>
<td>10</td>
<td>Roots</td>
<td>29.6</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

Implications for Traditional Medicine and Health care

- Loss of medicinal plants biodiversity from forests leads to:
  - High usage of substitutes and even adulterants.
  - Efficacy and quality of medicines affected, bringing the systems into disrepute.
  - Adverse impact on of trade and exports.
  - Permanent loss of biodiversity and threat of extinction to the rare, endangered and threatened species.

Substitutes and Adulterants

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Official Drug</th>
<th>Substitute/Adulterant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Saraca asoka bark</td>
<td>Polyalthia longifolia, Shorea robusta, Bauhinia variegata, Tremna orientalis</td>
</tr>
<tr>
<td>2</td>
<td>Berberis aristata</td>
<td>B. chitria, B. asiatica, B. lyrlic, Cocinimum fenestratum</td>
</tr>
<tr>
<td>3</td>
<td>Commiphora whightii</td>
<td>Boswellia serrata</td>
</tr>
<tr>
<td>4</td>
<td>Swertia chirayita</td>
<td>S. angustifolia, S. alata, Andrographis paniculata</td>
</tr>
</tbody>
</table>

Regulatory Framework

- CITES
- Biological Diversity Act 2002
- Indian Forest Act 1927
- Wild Life (Protection) Act 1972
- Forest (Conservation) Act 1980
- Negative List of 29 Plants
- State Laws:
  - AP Red Sanders wood Possession Rules 1989
  - Tamilnadu Sandalwood Transit Rules 1967
  - HP Forest Produce Transit rules 1977
  - MP Sustainable Harvesting Act 2005

Laws regulating Health sector

- Drugs and Cosmetics Act 1948
- Central Council for Indian Medicines Act
- Magic Remedies Act
- Schedule ‘T’ of DCA especially regulates the licensing, registration of AYUSH medicines and Quality aspects through GMPs
- Notification in 2008 requires AYUSH industry to maintain and furnish the medicinal plants consumed to State Drug Controller and NMPB—a landmark initiative to ensure traceability and hence quality.

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Kuth Story

- A critically endangered species (IUCN) used in Ayurvedic medicines - Annual consumption more than 500 MT
- Cultivated extensively until 1985. Was included in Appendix II in 1973 and upgraded to A I in Appendix I in 1985
- Also brought under Schedule 6 of WL(P) Act in 1991-92
- Area cultivated reduced to less than 40ha from 400ha
- Wild population declined by 70%
- India has become net importer in the last 15 years. Import during 2008-09 was 685 MT
- Available in Market/trade but without invoice
- Cultivation switched to Inula racemosa
- Occurs largely in J & K and virtually non-existent in wild in HP now. Not reported from Uttarakhand
- No conscious policy in FD to promote cultivation or promote regeneration in the wild

Guggal (Commiphora wightii)

- Used in more than 100 Ayurvedic preparations
- Guggulsterone a & b well known for anti-hyperlipidimic, anti-arthritis activity
- More than 100 patents
- Domestic consumption >1000MT
- Occurs in Rajasthan, Gujarat, MP, Maharashtra and Karnataka
- More than 90% demand met through imports-largely from Iran, Afghanistan, and Pakistan
- No conscious policy to conserve, regenerate under normal forestry schemes
- 4000 ha of coverage for the first time

Ashoka (Saraca asoca)

- Occurs in Western and Eastern ghats and the foothills of Eastern Himalayas
- Ashokarhist-the key Ayurvedic formulation for gynecological disorders
- Annual consumption of bark-20000MT
- IUCN categorized the species as globally vulnerable
- High incidence of use of Adulterants, viz Polyalthia longifolia, Shorea robusta, Tremna orientalis, Bauhinia variegata, Brownea ariza
- No specific regeneration program in FDs
- NMPB launched special projects for the species in Orissa, Karnataka, Kerala and Gujarat-estimated coverage of 1000 ha

Traditional Knowledge and IPR

- Patents on Indian Plants in US, Japan and EU countries a common occurrence. On an average about 2000 Patents on Indian Plants at IPOs every year
- A study showed that in US there are over 2300 patents on Yoga, 2315 trade marks at USPTO and 150 copyrights
- Traditional Knowledge existing in Sanskrit, Persian, Arabic, Urdu and Tamil one of the reasons for wrong patenting
- Haldi and Neem patents led to TKDL
- Biological Diversity Act 2002 regulates IPR on biodiversity and associated knowledge

Issues relating to TK (Non-codified)

- Novelty and innovation?
- Industrial application?
- No fixed life-held over generations
- Held by communities paralelly-difficulty of identification

Hence a separate law outside IPR/Patent Laws needed- sui generis

TKDL

Traditional Knowledge Digital Library

- An initiative of CSIR and Dept of AYUSH
- Fighting patent cases in foreign courts costly and time consuming besides being fraught with uncertainty
- To protect our documented traditional knowledge from wrong patenting
- Classical text which is in Sanskrit, Arabic, Persian, Urdu and Tamil transcribed in five English, French, Spanish, Japanese and German languages for ease of understanding by the IPOs
- Registration with IPOs for prior art search before a patent application is decided
- Non disclosure agreement to prevent misuse
- So far more than 2.34 lakh classical formulations digitized and transcribed
- Includes Yoga Asanas to prevent wrong patenting of Yoga

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Management/Developmental Interventions

- In situ Conservation through MPCA-Medicinal Plants Conservation Areas
- Herbal Gardens
- Field Gene banks
- Resource augmentation in Forest areas
- Cultivation
- R&D to promote use of substitute plants or plant parts
- Market information to promote cultivation through an informed choice exercised by growers

R & D to support Medicinal Plants Conservation

- Developing sustainable harvesting protocols for those species where destructive harvesting resorted (harvest of roots, barks, wood, Panchang)
- Identification of alternative plant parts or plants as substitutes and get such substitutes included in Pharmacopoeia - R & D into biological activities for comparative efficacy or otherwise
- Development of Agro-techniques to promote domestication through cultivation
- Standardization of Post harvest protocols and their dissemination

What can the Forestry Sector Do?

- Transit Rules rationalization- HP case (where Rs 7 per kg is charged for Issue of transit pass even for cultivated Chirayita)
- Forest (Conservation) Act 1980 needs to permit Medicinal Plants cultivation as a forestry activity
- Mainstreaming of Medicinal Plants in Management Plans- Presently these are clubbed under NTFP (In MP 90% of NTFP is Tendu Patta)
- Use of ITK in working plans
- FDCs being commercial entities can look at Medicinal Plants as a diversification option
- Incorporate medicinal plants in forest regeneration programs being closely linked to livelihood as well for sustainability of JFM

Thank you

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FORESTS AND COMMUNITY:
FORESTS AND SOCIETY:
FORGING PARTNERSHIPS

Ranjan Chatterjee
PLANNING COMMISSION

Forest conservation should be a priority not only to protect our green cover but also to ensure that the rights and interests of communities are protected.

Forests : PRE INDEPENDENCE

- The intrinsic relation between natural resources and community had been in great stress.

- Legislations put a restriction on the traditional access to and use of forest produce by the local population.

- Tamar Revolts in Jharkhand (1789-1832), Tribal Movement in Midnapur (1918-1924) were among the many revolts and uprisings against the Forest Act 1865 and the Forest Policy 1894.
**PARTICIPATORY JOINT FOREST MANAGEMENT**

- Empowerment of Gram Sabhas and marginalized section of the society.
- The enabling environment for sustainable livelihood option is participation of forest communities.
- Using innovation, local ingenuity and capacity building of stakeholders to achieve the larger goal of poverty alleviation.

**NEED FOR FORGING PARTNERSHIP AND INSTITUTIONALIZATION**

- Afforestation in non-conventional forest areas like farms, waste lands etc. needs to be promoted.
- The owners of such land being individuals, community, public authority and the state, afforestation would require forging partnership with farmers, community and different public authorities.

**SENSITISING PEOPLE TOWARDS FORESTS**

- Sensitising the masses to understand the crucial role that forests and forest dependant communities play as a part of sustenance of ecosystems is important.
- Sensitising students through awareness programmes to channelize their energy towards larger goals of conservation and development.

**WOMEN; THE ACTUAL CONSERVATORS**

- Gender budgeting can go a long way in providing livelihood and income options to women.
- Gender sensitive policies in areas of forest produce and its marketing, can help women procure their share of deserved incentives.

**SECURING OUR SACRED GROVES**

- The existence of 2 lakh sacred groves provide the much needed relief amidst the dynamics of rapid economic development and extreme scarcity of land resources.
- We would now require legal protection, citizen advocacy and a self-sustaining institutional mechanism to strengthen the community management to conserve them.

In order to manage the JFM Programme effectively, we should set our national objectives which should include -

- Multi-tier plantation,
- Promoting markets for NTFP and
- Technological inputs (which are low cost and locally adaptive)
WAY FORWARD

- Our approach should be ‘Care and Share’
- Transform our role from ‘Manager’ to ‘Facilitator’
- Promote people friendly implementation and incentivisation.
- Advocate the necessary change in the mind-set of planners and administrators at all levels.

THANK YOU

Be the change you want to see...